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ABSTRACT

While reading has been recognized as a potentially useful and enjoyable pastime for the elderly, physical and psychological decrements affect the ability of the elderly to read. As the eyes age, near-point tasks become more difficult. In addition to reduced sensory intake, perceptual changes occur. The central nervous system slows, and data travel more slowly to the brain and are integrated more slowly on arrival. Persistence of after images and increased noise in the neural system add to confusion and slow reaction time. While neither verbal abilities nor long term memory show much decline in the elderly, difficulty in forming a thought set and rigidity in using ineffective strategies affect cognitive processes. Eyeglasses, advanced methods of surgery, and specially designed reading materials are all available to compensate for the aging of the eyes. Motivation and experience are crucial in overcoming perceptual and cognitive deficits. Further research involving the elderly in reading studies is necessary. The use of elderly subjects in reading studies can also further knowledge of effects of motivation, experience, and textual organization on comprehension. (Author/HTH)

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Physical and Psychological Decrements Affecting Reading in the Aged

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Previous work has suggested that reading can be an important activity in the lives of the elderly. Reading can serve as both a leisure time activity and a means of obtaining information necessary for everyday living. It can provide a way to spend time alone or be the basis for a group experience (Lovelace, 1979; Wilson, 1979). Yet, despite all the value that reading can provide, few elderly people read (Kingston, 1979). While motivation is a contributor to this lack of interest, physical and psychological decrements associated with aging also affect reading behavior and partially explain the lack of interest in reading for the elderly. Researchers know that some of the decrements that are a part of the natural process of aging affect information processing and retrieval systems used in reading. This paper will discuss some of the important visual, perceptual, and cognitive changes that occur with age and affect the ability to read. Means for overcoming the decrements will be discussed, also.

DECREMENTS WITH AGE

Visual Changes

As part of the natural aging process, changes occur within the structure of the eye itself. The iris and pupil decrease in size with age;

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the lens becomes more opaque; the vitreous humor becomes thicker. Basically, three results of the physical changes in the eye affect the ability to read: 1) presbyopia (the inability to focus on near point); 2) higher threshold for illumination; 3) prolonged time needed for dark-light adaptation (McFarland, 1967). Less light is actually taken in by the aging eye and what is taken in is more diffused by the opacity and thickness of the eyeball itself. Thus, the elderly person finds it more difficult to focus on a page of print (Weale, 1965). The thickening of the lens to form cataracts has long been recognized as a visual problem in some elderly that requires special attention and compensation for reading. But all elderly people with or without cataracts need increased illumination and glare reduction when working with close materials because of the aging of the eye.

Perceptual Changes

In addition to physical changes within the eye, perceptual changes occur, also. It takes longer with increased age for an image to register in the brain as having been seen (Weale, 1965). This is partly caused by the reduced intake of sensory data, which is the fault of the aging eye (McFarland, 1967); but, in addition, research indicates that neural transmission to the brain centers slows with age (Griew, 1963). Two other perceptual processes contribute to decrements with age, also: 1) longer Preparatory Interval; 2) increase of both after effects and incidental neural activity (Welford, 1965).

A great deal of research has been done on the slowing of response time in the elderly (Botwinick, 1978). Current researchers agree that the slowing of response is due to a lengthening of Preparatory Interval in the central nervous system. This means that the elderly are slower to actually form a neural set for response, slower to attend (Rabbitt, 1965).

So, response is slowed by the longer time taken by the elderly to integrate stimuli rather than in the actual psychomotor response movement (McFarland, 1967).

In addition to the lengthening of Preparatory Interval, both the amount of neural noise and the length of after effects increase with age (Welford, 1965). As the neurological perceptual system begins to lose the ability to discriminate necessary stimuli from noise, there is a loss of ability to attend to appropriate stimuli (Rabbitt, 1965). This contributes to a general perceptual confusion, which is now commonly explained by the Stimulus Persistence Theory. This theory states that in addition to increased general noise on the neural pathways, the elderly person's perceptual images persist longer in the central nervous system. Thus, in a task requiring response to a series of fast-paced images, the old after image interferes with the new image, increases confusion, and lengthens response time (Axelrod, 1963; Welford, 1965; Botwinick, 1978).

In summary, four perceptual decrements occur with age: 1) There is a decrease in amount of sensory data taken in by the aging eye. 2) An increase occurs in both the time to transmit a neural signal to the central nervous system and in integration time once it gets there. 3) Amount of neural noise and persistence of after image effects add to perceptual confusion. 4) Response time is increased for all tasks. In turn, these perceptual factors contribute to changes in cognitive processing abilities in the elderly.

Cognitive Changes

The cognitive changes associated with age have been one of the most widely researched areas in gerontology. At present, consensus of opinion among researchers is that while short term memory ability decreases with age,

there are few changes in long term memory capacity. In addition, it is suggested that the elderly lose some ability to do abstract problem solving tasks but retain both concrete problem solving abilities and verbal intelligence capabilities (Botwinick, 1978). An intelligence test given to adults aged 40 to 70 showed no decrease in information and comprehension subtests and an increase with age on vocabulary and similarities subtests (Bromley, 1963). This suggests that the basic intellectual abilities necessary for reading remain intact with age. However, two factors that may have an adverse effect on reading comprehension are: 1) inability to integrate material and form a set for comprehension, and 2) decrease in ability to adapt, i.e. increased rigidity.

Experimental verbal learning tasks have shown that on a cognitive level, elderly fail to integrate information gathered from materials, to see patterns of similarities and differences in a problem, or to form a set for response. They find it more difficult to select the salient features or information in a task and to discard the irrelevant materials (Rabbitt, 1965; Arenberg, 1973). Thus, they are poorer than younger subjects at organizing a learning task independently (Botwinick, 1978).

In addition, people become more rigid with age thus finding it harder to change set once it is established. They will impose set on non-structured material (Riegel, 1965) and lump patterns or events into one category, thereby missing important differences and details (Welford, 1963).

Elderly people take longer to respond and to learn a task, but retain information as well as young people once they have learned (Arenberg, 1973). They can pick up speed on overlearned material (Riegel, 1965) but generally do best in self-paced situations (Welford, 1963) because of perceptual slowing and the cognitive factors mentioned here.

OVERCOMING THE DECREMENTS

Visual Prostheses

Great strides have been made mainly through the work of industry and medical science to compensate for the visual problems of the aged. New technology in the production of eyeglasses corrects presbyopia and increases acuity. Devices for increasing illumination are available, as are magnification devices. Advances in laser surgery make it easier and safer to remove cataracts at earlier stages. In addition, innovative methods of presenting written material are widely available. The Talking Books Program from the Library of Congress provides free materials to every library and private citizen in the United States. Books in large print and Braille books make it possible for the elderly, or any visually handicappped person, to continue reading despite the handicap. Therefore the natural aging of the eyes need not cause a decrease in reading.

Motivation and Interest

Motivation to read is the great means of compensation. While research shows that information intake, processing, and retrieval systems slow with age, the role of motivation in overcoming these and any physical decrements must not be minimized. Pleasure reading is, for the elderly, a self-paced task. Therefore, the slowing due to perceptual and cognitive changes is not of major consequence. While being a slower reader than in earlier life may frustrate some, it is a personal frustration and not a real factor causing inability to read. Motivation to read and the interest in materials presented can overcome problems caused by visual, perceptual, and cognitive decrements of aging.

This points to the fact that educators and parents need to train lifelong reading habits beginning in early childhood. For those who come to old age already loving to read, motivation can overcome the decrements of aging that should be hindrances. For those who are not already avid readers, the perceptual and cognitive slowing may make reading too laborious a task to be enjoyable. Experience and motivation can fully compensate for the decreased biological capacity associated with age (Griew, 1963), not only in reading but in all areas.

In addition, the key roles of experience and motivation as compensators points out the need for lifelong educational programs. Continuing education can keep people motivated and contribute to continued expansion of the experience base that is necessary to overcome biological degeneration (Baltes & Labouvie, 1973). Research into the types of materials that interest the elderly and the best formats for presentation of reading materials is needed.

Need For Further Research

The gerontological research on perceptual and cognitive decrements is abundant. Yet until very recently all of this research had been in an experimental, laboratory setting. Laboratory studies are unnatural tasks, and arouse a great deal of anxiety in the elderly (Riegel, 1965; Botwinick, 1978). It is impossible to separate learning from performance in any study. With the elderly anxiety about working in a laboratory setting on an unusual verbal task may affect performance to such an extent that it is not an accurate measure of ability to learn.

In addition, Botwinick (1978) states that in the available gerontological research on which all the conclusions about decrements occuring with age are based, education level has never been sufficiently controlled. Many of the

effects found with the elderly may be a function of the education level of the elderly samples used in research comparing young and old samples rather than true decrements of age.

Reading may present a way to further study verbal learning in the aged. Experimental psychologists (Rabbitt, 1977) acknowledge the fact that reading studies could make a contribution to knowledge about verbal learning behavior of the elderly.

Reading is a thought process, and as such, calls on a number of verbal learning skills, not just the isolated variables tapped in experimental verbal learning studies. The task of reading combines what is on the page with the reader's background experience and thought set. It is a more natural task than paired associates or serial learning tasks. Existing reading tests can provide some information on educational ability level, also.

While experimental studies can shed some light on the verbal behavior of the elderly, reading is a relatively untapped area of verbal learning that can add to the complete profile of elderly verbal behavior (Arenberg, 1973). In addition, researchers have seemingly overlooked the contribution that using an elderly sample may make on the study of reading comprehension. The elderly comprise a special group in society. The use of them in prose learning studies could shed light into the effects of motivation, adaptability, and textual organization on overcoming physical and psychological factors that should affect reading comprehension.

CONCLUSIONS

While reading has been recognized as a potentially useful and enjoyable pasttime for the elderly, physical and psychological decrements affect the ability of the elderly to read. The eyes age, and near-point

tasks become more difficult. In addition to reduced sensory intake, perceptual changes occur. The central nervous system slows; thus, data travels more slowly to the brain and is integrated more slowly once it arrives. Persistence of after images and increased noise in the neural system add to confusion and slow reaction time. While neither verbal abilities nor long term memory show much decline in the elderly, difficulty in forming a thought set, and rigidity in using ineffective strategies affect cognitive processing abilities.

Several means of overcoming visual decrements are available. Eyeglasses, advanced methods of surgery, and specially designed reading materials are all available to compensate for the aging of the eyes. The factors of motivation and experience are crucial in overcoming perceptual and cognitive deficits.

Finally, further research involving the elderly in reading studies is necessary. A number of the decrements found in experimental verbal learning studies may not affect performance on the more natural task of reading due to interest in and meaningfulness of material. In addition, the use of elderly subjects in studies of reading can further knowledge of the effects of motivation, experience, and textual organization on comprehension.

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